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[34] Title of the Invention: IC Card

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Specification

1. Title of the Invention IC Card

2. I claim:

In an IC card which has a base packaged in a resin-molded part, the improvement comprising a base having a metal plate formed integrally with a resin-molded part.

3. Detailed Description of the Invention

[Industrial Field of the Invention]

The present invention relates to an IC card.

[Description of the Prior Art]

Fig. 6 is a perspective view of an IC card made in accordance with the prior art. Fig. 7 is an exploded perspective view of the main part of the IC card in Fig. 6, and Fig. 8 is a section taken along Line b-b of Fig. 6.

In the drawings, (1), (2), and (3) are Base A, Base B, and a circuit board, respectively.

In construction, the circuit board (3) is sandwiched between Base A (1) and Base B (2) and joined through the mediacy of an adhesive layer (11). (9), (12), (13), and (14) are a joining surface, a metal plate, an insulating plate, and a spring, respectively. (15a), (15b), (16a), and (16b) are through-holes.

The function of the conventional IC card is explained below.

A circuit board (3), which is the main part of an IC card, is sandwiched between Base A (1) and Base B (2), and joined to a joining surface (9) through the mediacy of an adhesive layer (11) comprising glue and adhesive tape. To shield from electromagnetic interference and prevent the charging of static electricity, a metal plate (12) is attached to Base A (1) and Base B (2) by the mediacy of an insulating plate (13) coated with glue on both sides. By springs (14) that go in through-holes (15a), (15b), (16a), & (16b) provided on Base A (1) and Base B (2), the metal plates (12) on Base A (1) and Base B (2) are connected in contact with each other, thereby maintaining equal electric potential.

[Problems of the Prior Art to be Addressed]

Since the conventional IC card is constructed in aforesaid manner, a metal plate (12) has to be bonded to an insulating plate (13) first, and furthermore, springs (14) must be used to connect the metal plates (12) for Base A (1) and Base B (2) in contact with each other. During the assembly process, the metal plate (12) has to be bonded to the insulating plate (13) before it is bonded to Base A (1) or Base B (2). Then, Base A (1) has to be joined to Base B (2) by the mediacy of adhesive layer (11) applied or affixed to a joining surface (9) of Base B (2), after springs (14) are inserted in corresponding through-holes (15a), (15b), (16a), & (16b) of Base A (1) and Base B (2). The requirement of insulating plates (13) and springs (14) adds to the number of parts to be assembled and assembling time, and thus an effective solution for these problems has been long desired.

A principal object of the present invention is to eliminate the problems described above, and to realize an IC card wherein Base A (1) and Base B (2), provided to shield from electromagnetic interference and prevent the charging of static electricity, are connected, equipotential, in contact with each other like in the conventional device, and yet wherein the number of parts to be assembled and the time for assembly can be reduced.

[Measures for Solving the Problems]

An IC card in accordance with the present invention is achieved by forming a metal plate integrally with a resin-molded base, disposing a part of the metal plate in projection toward the side opposite to the side whereon it is mounted, and allowing the corresponding metal plate projections on the mating bases to connect in contact with each other.

[Function]

FINGER

An IC card in accordance with the present invention is achieved by disposing a part of a metal plate in projection, at an approximately right angle, toward the side opposite to the side whereon it is mounted, and forming said part of the metal plate concurrently with a resin-molded base, thereby shaping the base integrated with the metal plate whose part is projected toward the side opposite to the side whereon the plate is mounted.

[Preferred Embodiment]

A preferred embodiment of the present invention is described below.

Fig. 1 is a perspective view of the IC card. Fig. 2 is an exploded perspective view of the main part of the IC card in Fig. 2, and Fig. 3 is a section taken along Line a-a of Fig. 1. In the drawings, (1) through (3) and (9), (11), and (12) are equivalent to those shown in Figs. 6 and 8 for the prior art, and the detailed descriptions shall be omitted this time. In the drawings, a metal plate (4) is formed integrally with Base A (1). (5a), (6a), (7a), and (8a) are projections provided on a part of end faces of the metal plate (4) at an approximately right angle to the surface whereon the metal plate (4) is mounted. On the opposite side is Base B (2), which similarly has a metal plate (4) formed integrally therewith. (5b), (6b), (7b), and (8b) are projections provided on a part of end faces of the metal plate (4) at an approximately right angle to the surface whereon the metal plate (4) is mounted. (10) is internal resin.

The function of the preferred embodiment is described below.

A circuit board (3), the main part of the IC card, is sandwiched between Base A (1) and Base B (2) for protection and packaging, and joined to a joining surface (9) through the mediacy of an adhesive layer (11). Base A (1) and Base B (2) are made of resin and have a metal plate (4) formed integrally therewith. Metal plate projections (5b), (6b), (7b), & (8b) are disposed on a part of end faces of the metal plate (4) so that they mate with corresponding metal plate projections (5a), (6a), (7a), & (8a). When Base A (1) is joined securely to Base B (2), these sets of metal plate projections connect in contact and electrically with each other.

Since the metal plate projections (5a), (6a), (7a), & (8a) are to be electrically connected with (5b), (6b), (7b), & (8b), the metal plate (4) should be made of a material that does not develop oxide film. If a metal susceptible to oxidation is used, the contacting parts in the projections require surface treatment such as plating with a metal that will not cause oxidation.

Fig. 4 shows how the metal plate projections (5a) & (6a) contact with the metal plate projections (5b) & (6b).

Internal resin (10) covers the insides of Base A (1) and Base B (2), thereby insulating the circuit board (3) and the metal plate (4).

Aforesaid embodiment of the invention employs the metal plate projections (5a), (5b), (6a), (6b), (7a), (7b), (8a) & (8b) provided on four portions on each of Base A (1) and Base B (2), but the number of the connections-in-contact may be one pair or greater at one or more portions. It is also possible to provide a hole (18) on one set of the metal plate projections (5a), (6a), (7a), & (8a) and a tab (19) on the other set of the metal plate projections (5b), (6b), (7b), & (8b) as shown in Fig. 4, or a tongue (20) on one set of the metal plate projections (5a), (6a), (7a), & (8a) and a groove (21) on the other set of the metal plate projections (5b), (6b), (7b), & (8b) as shown in Fig. 5, to achieve a similar effect and improved fixing strength through the joining plus the adhesive layer (11).

[Advantageous Result of the Invention]

As described so far, a base in accordance with the present invention is formed integrally with a metal plate having projections on a part of end faces, thereby reducing the number of parts and assembly processes.

4. Brief Description of the Drawings

Fig. 1 is a perspective view of an IC card in a preferred embodiment of the present invention. Fig. 2 is an exploded perspective view of the main part of the IC card, and Fig. 3 is a sectional view of Fig. 1. Figs. 4 and 5 are perspective views of metal plate projections in another embodiment of the invention. Fig. 6 is a perspective view of a conventional IC card. Fig. 7 is an exploded perspective view of the main part of the IC card in Fig. 6, and Fig. 8 is a section taken along Line b-b of Fig. 6.

In the drawings, (1), (2), and (3) are Base A, Base B, and a circuit board, respectively. (4) is a metal plate, and (5a), (5b), (6a), (6b), (7a), (7b), (8a) and (8b) are projections on the metal plate. (9), (10) and (11) are a joining surface, internal resin, and an adhesive layer, respectively. (18) is a hole, (19) is a tab, and (20) and (21) are a tongue and a groove.

Items with the same identification number are identical or equivalent.

Masuo O iwa, Patent Attorney

Fig. 1

- 1: Base A
- 2: Base B
- 3: Circuit board

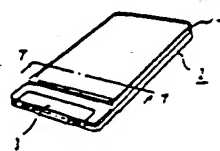
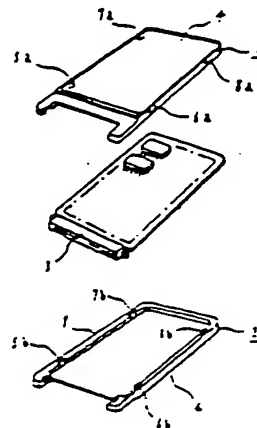


Fig. 2

- 4: Metal plate
- 5a: Projection on metal plate
- 6a: Ditto
- 7a: Ditto
- 8a: Ditto
- 5b: Ditto



- 6b: Ditto
7b: Ditto
8b: Ditto
9: Joining surface

Fig. 3

- 10: Internal resin
11: Adhesive layer

Fig. 4

- 18: Hole
19: Tab

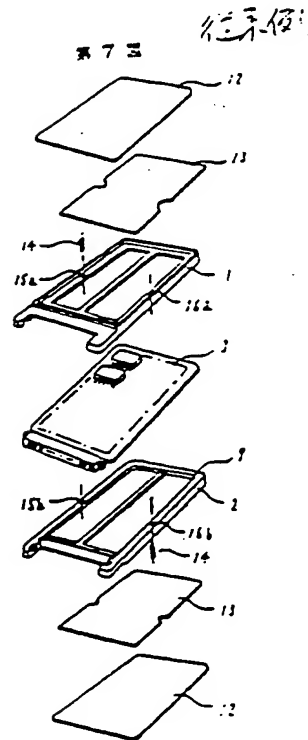
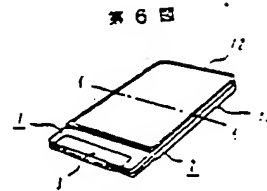
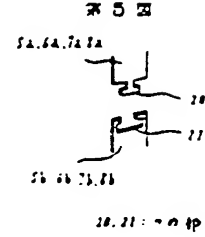
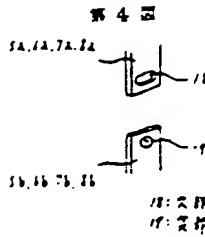
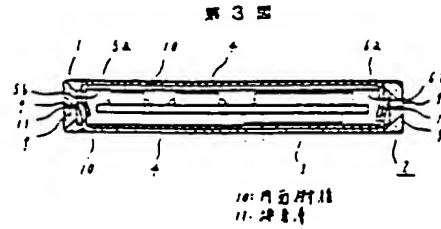
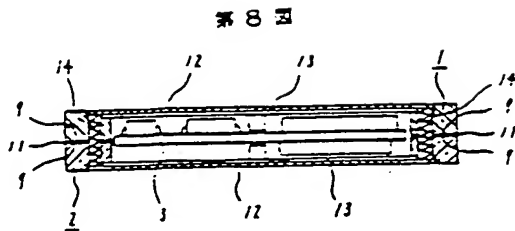
Fig. 5

- 20: Tongue
21: Groove

Fig. 6

- Fig. 7
The prior art

Fig. 8



Amendment Sheet (Process)

October 14, 1988

To: Director-General of the Patent Office

1. File Reference

Unexamined Publication of Patent Application No. Sho 63-165322

2. Title of the Invention

IC Card

3. Amending Entity

Connection with the File: Applicant of the patent.

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5. Date of Effect of Amendments

September 27, 1988 (Date of Mailing)

6. Object of the Amendment

Section: Detailed Description of the Invention

7. Content of the Amendment

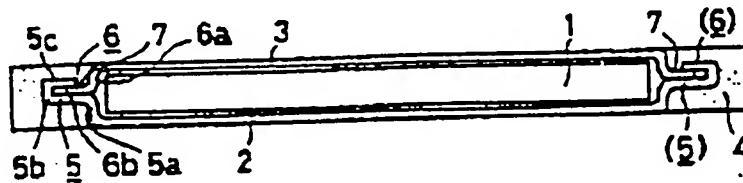
The Specification initially attached to the Application Form should be rewritten as shown in the separate sheet, to improve its readability. (No change to the content of the Specification.)

8. List of Attachments

Page 7 of the rewritten Specification: One copy.

1. Japanese Laid-open Patent No. 2-164599 (published on June 25, 1990)

This patent discloses a thin-shaped electronic device in which a printed circuit board 1 is sandwiched by a first metallic plate 2 and a second metallic plate 3 and the outer peripheral edges are molded 4 to fix the first and second metallic plates. See the following figure.



2. Japanese Laid-open Patent No. 3-29394 (published on February 7, 1991)

This patent discloses a metallic case for housing an IC which comprises a metallic container 3 having a bottom plate 2a and side walls 2b which define a space 1 for housing the IC therein and a metallic rid member 18 having a top plate 18 and side walls 18 which are joined onto the side walls of the metallic container 3. The metallic container 3 has a resin frame member 13 which is arranged at the inside of the side walls 2b circumferentially. The metallic rid member 18 is soldered to the metallic container 3 at some points of the joined portion. As you see from the following figures, the frame member 13 does not encapsulate the side walls 2b, so that it is different from the mold of the patent.

